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FLOOD INSURANCE STUDY

CITY OF EDGEWATER, FLORIDA

VOLUSIA COUNTY

JUNE 4, 1990

Federal Emergency Management Agency

COMMUNITY NUMBER - 120308

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY

CITY OF EDGEWATER,
VOLUSIA COUNTY,
FLORIDA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study revises and supersedes a previous Flood Insurance Study for the City of Edgewater, Volusia County, Florida (Reference 1). This information will be used by the community to update existing floodplain regulations as part of the regular phase of the National Flood Insurance Program. The information will also be used by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic technical and scientific data prepared by the Federal Emergency Management Agency (FEMA) for purposes of the National Flood Insurance Program. The data were identified as the best available at the time of compilation of this Flood Insurance Study and should depict the general conditions of the flooding sources with relative accuracy. FEMA performed a cursory review and accepted the data as valid for purposes of this Flood Insurance Study and the National Flood Insurance Program. However, if better information is known to exist or has been developed since the date of this report, the information should be immediately forwarded to the Natural and Technological Hazards Division, FEMA, Atlanta, Georgia, for consideration for revision of this study.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed for FEMA and completed in August 1978. Additional coastal analyses were performed by FEMA to provide sufficient information for delineation of the floodplain boundaries for the City of Edgewater.

1.3 Coordination

On August 10, 1987, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the community and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Edgewater, Volusia County, Florida. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected based on the extent and validity of available existing hydrologic and hydraulic data. A detailed coastal flooding analysis was performed on the Atlantic Ocean, where flooding propagates inland to affect the City of Edgewater.

Approximate methods of analysis were used to study all remaining areas having a potential flood hazard that did not have detailed scientific or technical data available.

2.2 Community Description

The City of Edgewater is situated in southeastern Volusia County. The City is bordered on the northeast by the City of New Smyrna Beach, and on the east, south, and west by the unincorporated areas of Volusia County. The City is served by U.S. Route 1 and the Florida East Coast Railway. The 1980 population of Edgewater was reported to be 6,726 (Reference 2).

Precipitation within the study area ranges from 48 to 64 inches per year. Due to hurricane activity, the precipitation range varies. The annual mean temperature for Edgewater is approximately 70 degrees Fahrenheit.

2.3 Principal Flood Problems

Edgewater is subject to storm surge flooding as a result of hurricane and tropical storm activity. Flooding is caused by large tidal surges into the Indian River combined with the heavy rainfall that accompany these storms.

2.4 Flood Protection Measures

Flood protection measures are not known to exist within the study area.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for

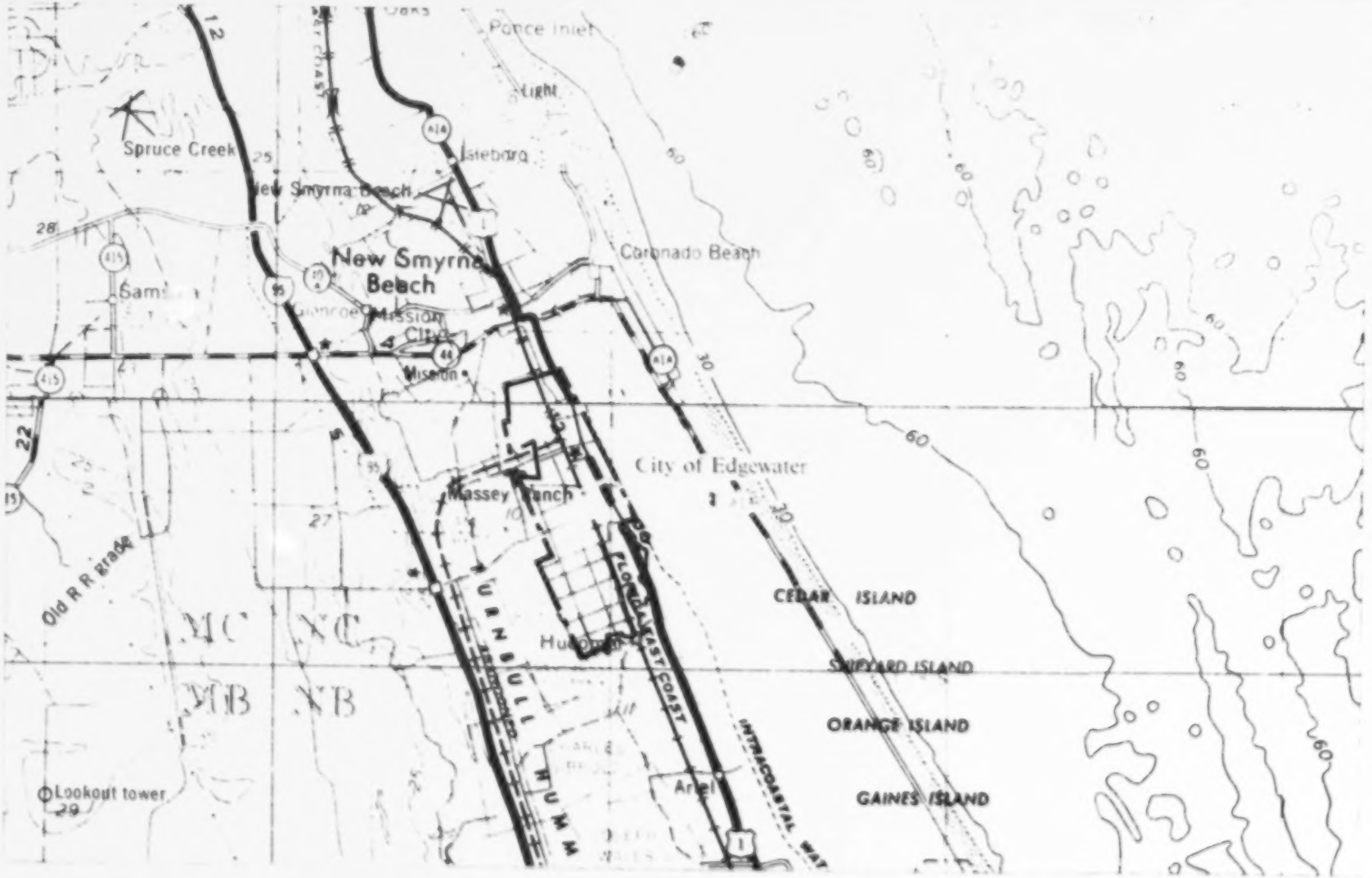

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF EDGEWATER, FL
(VOLUSIA CO.)

APPROXIMATE SCALE
0 3 6 9 MILES

VICINITY MAP

floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40-percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60-percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each stream studied in detail in the community.

Peak discharge-frequency relationships for freshwater floods of the selected recurrence intervals for South Canal and E Canal were estimated from a regional flood-frequency analysis prepared for this study. This analysis was based on the gage records of three stations, with lengths of record of 25 years, 15 years, and 12 years. The gaging stations are located at the mouth of South Canal, at the mouth of E Canal, and at Fern Palm Drive on E Canal. The regional flood-frequency analysis provides two curves; the first expresses the flood discharge-time relation, showing variation of peak discharge expressed as a ratio to the mean annual flood, with recurrence interval. The second relates the mean annual flood to drainage area (Reference 3). Thus, by delineating drainage areas of South Canal and E Canal, peak discharges for the selected recurrence intervals could be estimated.

Peak discharge-drainage area relationships for South Canal and E Canal are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS)			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
SOUTH CANAL					
at mouth	4.43	372	429	439	491
E CANAL					
at mouth	3.87	192	236	256	280
at Fern Palm Drive	2.66	132	162	176	192

Inundation from the Atlantic Ocean caused by passage of storms (storm surge) was determined by the joint probability method (Reference 4). The storm populations were described by probability distributions of five parameters that influence surge heights. These parameters were central pressure depression (which measures the intensity of the storm), radius to maximum winds, forward speed of the storm, shoreline crossing point, and crossing angle. These characteristics were described statistically based on an analysis of observed storms in the vicinity of the City of Edgewater. Primary sources of data for this analysis were "Tropical Cyclones of the North Atlantic Ocean, 1871-1977," "Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States," and "Meteorological Criteria for Standard Project Hurricane and Probable Maximum Hurricane Wind Fields, Gulf and East Coasts of the United States" (References 5-7).

For areas subject to flooding directly from the Atlantic Ocean, the FEMA standard storm surge model SURGE (Reference 8) was used to simulate the coastal surge generated by any chosen storm (that is, any combination of the five storm parameters defined previously). By performing such simulations for a large number of storms, each of known total probability, the frequency distribution of surge height can be established as a function of coastal location. These distributions incorporate the large-scale surge behavior, but do not include an analysis of the added effects associated with much finer scale wave phenomena, such as wave height or runup. As the final step in the calculations, the astronomic tide for the region is then statistically combined with the computed storm surge to yield recurrence intervals of total water level (Reference 9).

A reanalysis of the hurricane storm surge for the Atlantic Ocean was performed by FEMA using the storm surge model SURGE (Reference 8). The reanalysis was performed to model two breach locations near Ponce de Leon Inlet. The 1984 Thanksgiving Day northeaster, which caused high flooding in and around Ponce de Leon Inlet, was also modeled by FEMA using SURGE. These reanalyses showed significant increases in stillwater elevations near Ponce de Leon Inlet over the elevations shown in the previous Flood Insurance Study for the City of Edgewater (Reference 1).

The storm-surge elevations for the 10-, 50-, 100-, and 500-year floods have been determined for the City of Edgewater and are shown in Table 2, Summary of Stillwater Elevations. The analyses reported herein reflect the stillwater elevations due to tidal and wind setup effects but do not include the contributions from wave action effects.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of streams in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each stream studied in the community.

Hydraulic analyses were performed based on a combination of methods using the hydraulic characteristics of the canals and accounting for storage in the upstream terrace areas.

FLOODING SOURCE AND TRANSECT	FLOOD INSURANCE RATE MAP PANEL	STILLWATER ELEVATION (FEET NGVD)[1]				ZONE	BASE FLOOD ELEVATION[1] (FEET NGVD)
		10 YEAR	50 YEAR	100 YEAR	500 YEAR		
INDIAN RIVER							
1, 2	0001, 0002	4.2	5.7	8.0	9.3	AE	8-9

[1]ROUNDED TO THE NEAREST FOOT AND MAY INCLUDE EFFECTS OF WAVE ACTION
[2]DUE TO MAP SCALE LIMITATIONS, BASE FLOOD ELEVATIONS SHOWN ON MAP MAY REPRESENT AVERAGE ELEVATIONS FOR THE ZONES DEPICTED

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF EDGEWATER, FL
(VOLUSIA CO.)

SUMMARY OF STILLWATER ELEVATIONS

INDIAN RIVER

Water-surface profiles for South Canal inland from the Indian River, along the northern corporate limits of the City of Edgewater and for E Canal from the Indian River north to the east side of the Florida East Coast Railway tracks were developed using the U.S. Geological Survey (USGS) step-backwater computer program (Reference 10). Computations of water-surface elevations above culverts were done manually or using the USGS Computer program for automatic computation of stage-discharge relations at culverts (Reference 11).

It was assumed that maximum tidal elevations and maximum freshwater flood elevations will not occur simultaneously. When the tide is highest, flow in South Canal and E Canal will be upstream, not toward the coast. Downstream flow will occur during the freshwater flood peak. Certain culverts or series of culverts in South Canal and E Canal restrict floodflows in both directions, resulting in appreciably higher water-surface elevations upstream (with respect to flow direction) of the culverts than downstream. These culverts, under Magnolia Street and U.S. Route 1 on South Canal, and under the Florida East Coastal Railway tracks on E Canal, form the boundaries between areas where tidal and freshwater floods predominate under all but the most severe (500-year) flooding conditions.

Shallow freshwater flooding, partly due to the culverts and partly due to the nature of the area, makes storage an important consideration in the wide, flat terrace areas upstream of the control culverts. Shallow flooding in the terrace areas is created by inadequate drainage. To account for storage, stage-discharge ratings upstream of the control culverts in each of the two canals were developed from step-backwater results. These ratings, together with stage-volume curves constructed from cross section properties and input hydrographs developed from regional streamflow records, provided input to a reservoir-routing computer program developed by the USGS (Reference 12).

The program simulated storage of excess rainfall in the terrace areas above the control culverts, thereby reducing peak discharge and maximum freshwater flood elevation in those areas. Thus, the stream profiles reflect the superposition of tidal flood elevations on the downstream sections of the step-backwater profiles and the superposition of storage-adjusted freshwater flood elevations at the upstream ends of the backwater profiles.

Cross-section data for canals in Edgewater were obtained by field survey. Bridges and culverts were also surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles.

Roughness coefficients (Manning's "n") for South and E Canals were estimated by field inspection at representative cross sections. Values within the channels ranged from 0.012 to 0.045; outside the channels, the value was 0.055.

Starting water-surface elevations for South Canal and [illegible] were taken from the analysis of the Indian River performed for the Flood Insurance Study for the City of New Smyrna Beach, Florida (Reference 13).

Hydraulic analyses, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding sources studied, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the shorelines.

The FEMA storm surge model (Reference 8) was utilized to simulate the hydrodynamic behavior of the surge generated by the various synthetic storms. This model utilizes a grid pattern approximating the geographical features of the study area and the adjoining areas. Surges were computed utilizing grids of 5 nautical miles, and 1,000 feet, depending on the resolution required.

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in a report prepared by the National Academy of Sciences (NAS) (Reference 14). This method is based on the following major concepts. First, depth-limited waves in shallow water reach a maximum breaking height that is equal to 0.78 times the stillwater depth. The wave crest is 70-percent of the total wave height above the stillwater level. The second major concept is that wave height may be diminished by dissipation of energy due to the presence of obstructions, such as sand dunes, dikes and seawalls, buildings, and vegetation. The amount of energy dissipation is a function of the physical characteristics of the obstruction and is determined by procedures prescribed in the NAS report (Reference 14). The third major concept is that wave height can be regenerated in open fetch areas due to the transfer of wind energy to the water. This added energy is related to fetch length and depth.

Wave heights were computed along transects (cross-section lines) that were located along the coastal areas, as illustrated in Figure 3, Transect Location Map, in accordance with the "Users Manual for Wave Height Analysis" (Reference 9). The transects were located with consideration given to the physical and cultural characteristics of the land so that they would closely represent conditions in their locality. Transects were spaced close together in areas of complex topography and dense development. In areas having more uniform characteristics, they were spaced at large intervals. It was also necessary to locate transects in areas where unique flooding existed and in areas where computed wave heights varied significantly between adjacent transects.

Each transect was taken perpendicular to the shoreline and extended inland to a point where wave action ceased. Along each transect, wave heights and elevations were computed considering the combined effects of changes in ground elevation, vegetation, and physical features. The stillwater elevations for the 100-year flood were used as the starting elevations for these computations. Wave heights were calculated to the nearest 0.1 foot, and wave elevations were determined at whole-foot increments along the transects. The location of the 3-foot breaking wave for determining the

FIGURE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF EDGEWATER, FL
(VOLUSIA CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

TRANSECT LOCATION MAP

terminus of the V Zone (area with velocity wave action) was also computed at each transect. Table 3 provides a listing of the transect locations and stillwater starting elevations, as well as initial wave crest elevations.

TABLE 3 - TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS, AND INITIAL WAVE CREST ELEVATIONS

TRANSECT	LOCATION	ELEVATION (FEET)* STILLWATER	WAVE CREST
1	Approximately 1,500 feet north of Park Avenue from the Atlantic Ocean coastline westward across the Indian River/Intracoastal Waterway floodplain	8.0	9.0
2	Approximately 200 feet north of Turgot Avenue from the Atlantic Ocean coastline westward across the Indian River/Intracoastal Waterway floodplain	8.0	9.0

*Indian River/Intracoastal Waterway

Figure 3 represents a sample transect that illustrates the relationship between the stillwater elevation, the wave crest elevation, the ground elevation profile, and the location of the V/A zone boundary.

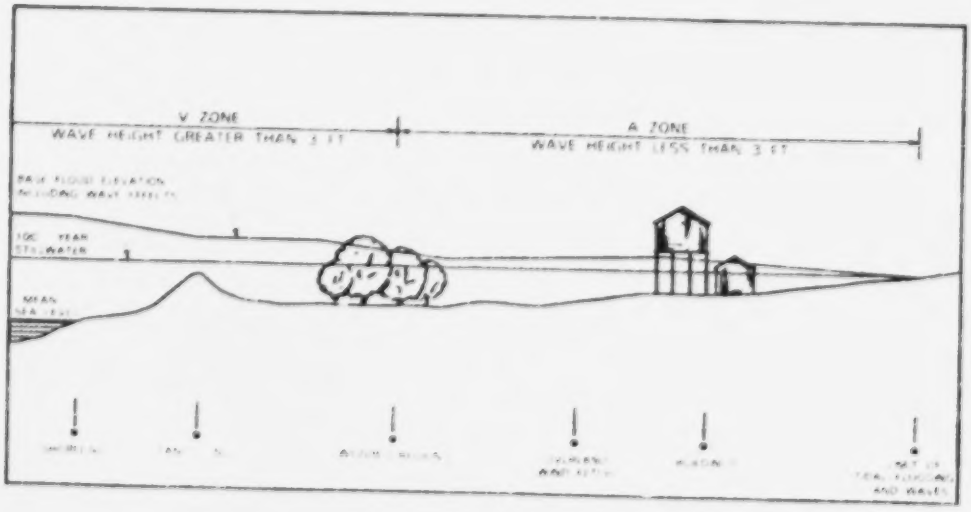

FIGURE 3 - Transect Schematic

After analyzing wave heights along each transect, wave elevations were interpolated between transects. Various source data were used in the interpolation, including topographic maps (References 15-17), beach profiles (Reference 18), aerial photographs (References 19 and 20), and engineering judgment. Controlling features affecting the elevations were identified and considered in relation to their positions at a particular transect and their variation between transects.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each flooding source studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each transect. Between transects, the boundaries were interpolated using topographic maps at a scale of 1:24000 with a contour interval of 5 feet (Reference 15).

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE) and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the flooding sources studied by approximate methods, only the 100-year floodplain boundary is shown on the Flood Insurance Rate Map.

4.2 Floodways

No floodway was delineated for the Indian River because it is inundated by tidal flooding. No floodways were delineated for South and E Canals because their 100-year floodplains are less than 200 feet wide and portions of the canals are inundated by tidal flooding.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains.

7.0 OTHER STUDIES

A Flood Insurance Study published for the City of New Smyrna Beach, Florida (Reference 13) does not agree with this study along the Indian River coastline due to a new analysis for the back bay area that is included in this study. The Flood Insurance Study for New Smyrna Beach may be revised in the future.

A revision to the Flood Insurance Study in progress for Volusia County, Florida (Reference 21) is in agreement with this study.

This Flood Insurance Study supersedes the previously published Flood Insurance Study for the City of Edgewater (Reference 1).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To assure that any user is aware of all revisions, it is advisable to contact the map repository of flood hazard data located in the community.

9.0 REFERENCES AND BIBLIOGRAPHY

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18. Florida Department of Natural Resources, Bureau of Beaches and Shores, Volusia County Beach Profiles, Scale 1:600, 1972.

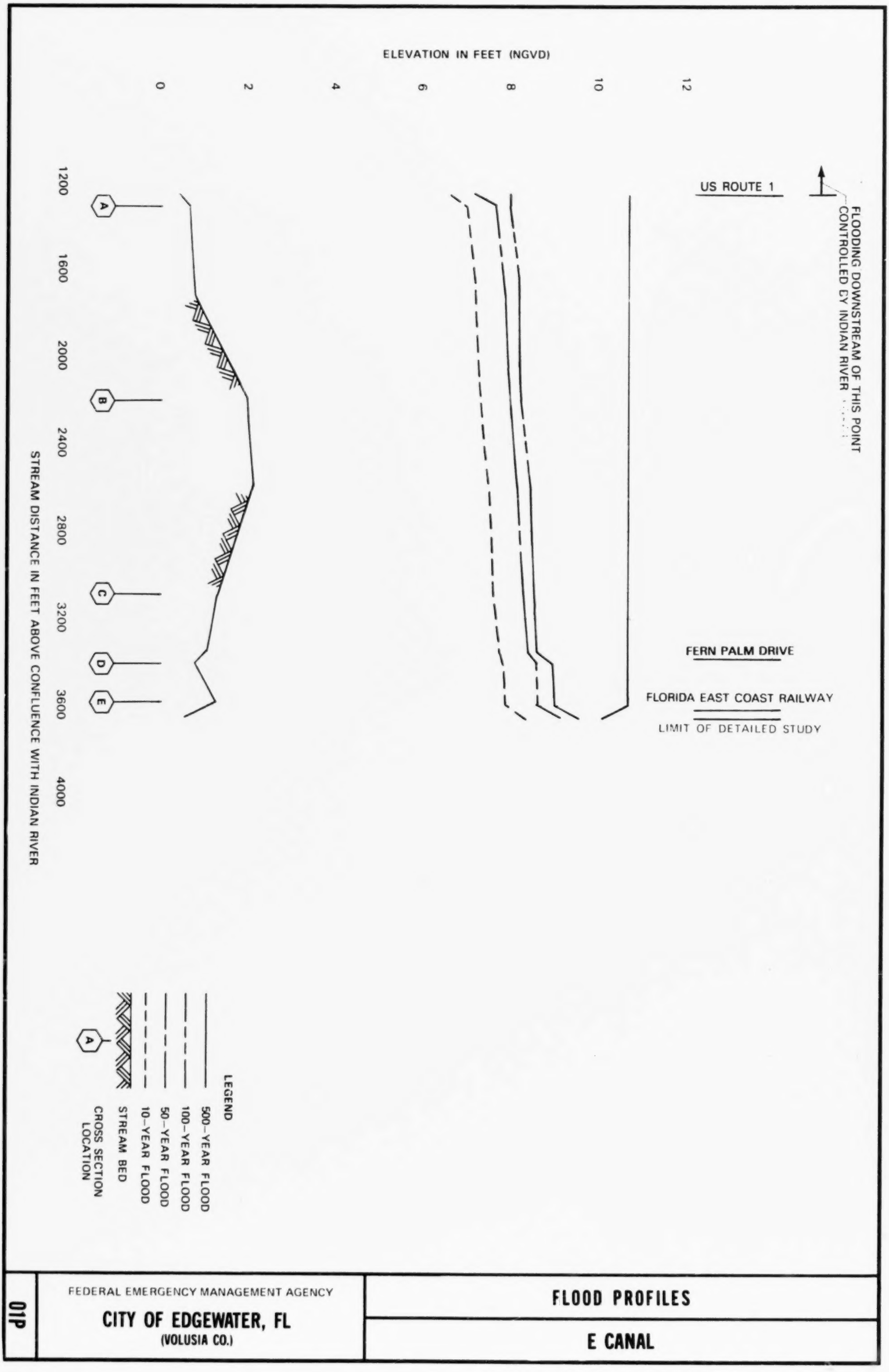
19. Federal Emergency Management Agency, Stereoscopic Aerial Photography of Volusia County, Florida, Scale 1:12000, January 1981.

20. Florida Department of Transportation, Stereoscopic Aerial Photography of Volusia County, Florida, Scale 1:12000, August 1978.

21. ————, Flood Insurance Study, Volusia County, Unincorporated Areas, Florida, April 1983, revision in progress.

ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0001	7.81	cross cut in northwest corner of east bridge curb at north end of bridge on Riverside Drive at intersection with Hamilton Drive
2	0001	8.52	PK nail in pole No. 268 DM 119 located on east side of Riverside Drive opposite Indian River Boulevard
3	0001	6.57	railroad spike in pole located on west side of Perdita Avenue, 335 feet south of West Knapp Avenue
4	0001	4.08	PK nail in pole No. 268 DM 457 located on east side of Fern Palm Drive, first pole south of 16th Street
5	0001	9.93	top iron pin in concrete monument located on east side of Needle Palm Drive, about 70 feet north of 18th Street



01P	FEDERAL EMERGENCY MANAGEMENT AGENCY **CITY OF EDGEWATER, FL** (VOLUSIA CO.)	**FLOOD PROFILES** **E CANAL**

FLOOD PROFILES

SOUTH CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF EDGEWATER, FL
(VOLUSIA CO.)

02P